

REMARKS

By the present amendment, claims 1, 5, to 10 and 36 are pending in the application.

Restriction Requirement

In response to the Restriction Requirement, non-elected claims 11 to 35 and 37 to 42 have been canceled by the present amendment without prejudice to the filing of a divisional application(s) directed to the non-elected claims.

Claim Amendments

Claim 1

The amounts of Si, Mn, La, Ce, P, Ti, and Nb added by amendment to claim 1 are supported by prior, now canceled, dependent claims 2 and 3.

Cu: 0.03 - 0.5%, added to amended claim 1, is supported in the specification, e.g., at page 22, lines 7 to 9.

In response to the rejection under 35 U.S.C. §112, second paragraph, “remainder consisting of” has been amended to read --remainder being--.

Claims 8 and 10

In response to the rejection under 35 U.S.C. §112, second paragraph, claims 8 and 10 have been amended to make clear that the --stainless steel-- sheet thickness is being claimed.

Claim 9

In response to the rejection under 35 U.S.C. §112, second paragraph, claim 9 has been amended to be dependent on claim 8.

§112, ¶2

Claims 1 to 10 and 36 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

In response to this rejection, the claims have been amended by the present amendment taking into account the comments of the Office Action. The claim amendments have been previously discussed.

In view of the present amendment, it is respectfully requested that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

§102/§103

Claims 1 to 4, 6, 8, 9 and 36 were rejected under 35 U.S.C. §102(b) as being unpatentable over Japan No. 4-350148 to Shimizu et al.

Claims 1 and 5 to 7 were rejected under 35 U.S.C. §102(b) as being unpatentable over EP 0 392 203 to Emmerich et al.

Claims 7, 9, 10 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 4-350148 to Shimizu et al.

Claims 7 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 4-350148 to Shimizu et al. in view of EP 0 497 992 to Sato et al.

These rejections, as applied to the amended claims, are respectfully traversed.

The Present Invention

The present invention provides a high Al-containing Fe-Cr-Al based stainless steel sheet and a high Al-containing double layered sheet comprising Al or an Al alloy adhering to the surface of the Fe-Cr-Al based stainless steel sheet.

The high Al-containing Fe-Cr-Al based stainless steel sheet is, as stated in the amended claim 1, characterized by comprising, by weight, Cr: 10 - 30%, Al: > 6.5 - 15%, Si: 0.1 - 1.0%, Mn: ≤ 0.5%, La: 0.01 - 0.1%, Ce: 0.01 - 0.1%, P: 0.01 - 0.05%, Cu:

0.03 - 0.5%, and either or both Ti: 0.02 - 0.1% and Nb: 0.02 - 0.3%, with the remainder being Fe and unavoidable impurities.

The high Al-containing Fe-Cr-Al based stainless steel sheet and a high Al-containing double layered sheet of the present invention have an excellent oxidation resistance and an improved wettability of brazing materials.

That is, since a high Al-containing Fe-Cr-Al based stainless steel containing more than 6.5% of Al, and La, Ce, and P, has an oxidation resistance that is greatly improved, wettability of the brazing materials is impaired due to formation of oxide film on the surface of the steel sheet during the heat treatment of brazing.

It was discovered that Cu has the effect of improving wettability of the brazing materials. Therefore, Cu of 0.03 to 0.5% is added to the stainless steel sheet of the present invention in order to improve wettability of the brazing materials. See, e.g., specification page 21, line 35 to page 22, line 9.

Patentability

Japan No. 4-350148 ("JP '148")

JP '148 relates to a Fe-Cr-Al alloy excellent in durability and catalyst carrier using the same and discloses a Fe-Cr-Al alloy containing, by weight, C: ≤ 0.05 , Si: $\leq 0.2\%$, Mn: $\leq 1.0\%$, P: $\leq 0.040\%$, Cr: 18 - 28%, Ni: $\leq 0.3\%$, Cu: $\leq 0.3\%$, Al: 1 - 10%, N: $\leq 0.02\%$ and the balance Fe with inevitable impurities, and Si, Mn, P, Ni and Cu satisfying the equation below.

$$9.5 \text{ Si} + 2 \text{ Mn} + 10 \text{ P} + 3.6 (\text{Ni} + \text{Cu}) - 2.5 \leq 0$$

JP '184 also discloses that this steel may further contain, by weight, LA: 0.01 - 0.20% (claim 2), one or more of Y: 0.05 - 0.5 and Hf: 0.01 - 0.3% in total amount of lanthanide except La of 0.01 - 0.20% (claim 3) and at least one selected from Ti, Nb, Ta and V in total of 1.0% or less.

As described in paragraph [0010] of JP '148, since Si, Mn, P, Ni, Cu accelerate precipitation of intermetallic compounds to the grain boundaries of the honeycomb foil and accelerate embrittlement of the foil at high temperature, the content of these element is preferably reduced as low as possible. (Cu: 0.3% or less).

Thus, JP '148 does not disclose or suggest adding Cu of 0.03 to 0.5% in order to improve wettability of the brazing materials.

Although, the Example steel A7 of JP '148 contains Cu of 0.03% and Al of 6.5% or more, this steel does not contain La, Ce and P as essential components. Therefore the effects of the present invention cannot be obtained by JP '148.

As explained above, JP '148 does not disclose or suggest improving wettability of the brazing material. More specifically, JP '148 does not disclose or suggest improvement of wettability of the brazing materials in the high Al-containing Fe-Cr-Al based stainless steel sheet by adding Cu in the specified range (0.03 to 0.5%).

The present invention is different from the technology of JP '148 and cannot be derived from JP '148.

EP 0 392 203 ("EP '203")

EP '203 relates to a ductile semi-finished material having a Fe-Cr-Al basis and its use as a substrate for catalysts, and discloses a ductile metallic semi-finished material in the form of foils consisting essentially of, by weight, Cr: 10 - 30%, Al: 4 - 15% and 0.005 to 1% of rare earth metals, Y, Ti, Zr, Hf, Nb, Ca, Be and Mg.

Although EP '203 discloses a Fe-Cr-Al based semi-finished steel foil containing Mg together with rare earth metals, Ti and Nb, EP '203 does not disclose or suggest that the steel foil must contain Cu in a specified range in order to improve wettability of the brazing materials.

Therefore, the present invention is not disclosed or suggested by EP '203.

EP 0 497 992 (“EP ‘992”)

EP ‘992 relates to a stainless steel for an automobile exhaust gas purifying catalyst carrier and process for preparation the same and discloses a stainless steel foil which is a cold rolled, rapidly solidified foil comprising, by weight, Al: 1.0 - 20%, Cr: 5 - 30%, Mn: $\leq 2\%$, Si: $\leq 3\%$ and C: ≤ 1 , with the balance being Fe and unavoidable impurities, wherein the thickness is 30 - 70 μm and the variation of the thickness is within $\pm 20\%$ of the average thickness.

Further, EP ‘992 discloses that the stainless steel may further contain, by weight, one or both of (a): at least one element selected from the group consisting of Y, Sc and REM: $\leq 0.3\%$ and (b) at least one element selected from the group consisting of Ti, Nb, Zr, Hf, V, Ta, Mo and W: $\leq 2\%$.

Although EP ‘992 discloses a Fe-Cr-Al stainless steel containing rare earth metal, Ei and Nb, EP ‘992 does not disclose or suggest the stainless steel must contain Cu in a specified range in order to improve wettability of the brazing materials.

Therefore, the present invention is not disclosed or suggested by EP ‘992 combined with JP ‘148 and/or EP ‘203.

As explained above, although the cited references disclose a Fe-Cr-Al stainless steel containing rare earth metals, Ti and Nb, these references do not disclose or suggest a Fe-Cr-Al stainless steel which must contain 0.03 to 0.5% of Cu in order to improve wettability of the brazing materials.

None of these references disclose or suggest the improvement of wettability of brazing materials, which is an important characteristic a Fe-Cr-Al stainless steel sheet used for a catalyst carrier, caused by a required specified amount of Cu (0.03 to 0.5%) present in a high Al-containing Fe-Cr-Al stainless steel.

It is therefore submitted that amended independent claim 1, and all claims dependent thereon, are patentable over JP '148, and/or EP '203, alone, or in view of EP '992.

CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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